

# Alaska Energy Authority Project Development Assistance

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Heat Program

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Workshop

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# Heating Technologies



## ■ Biomass

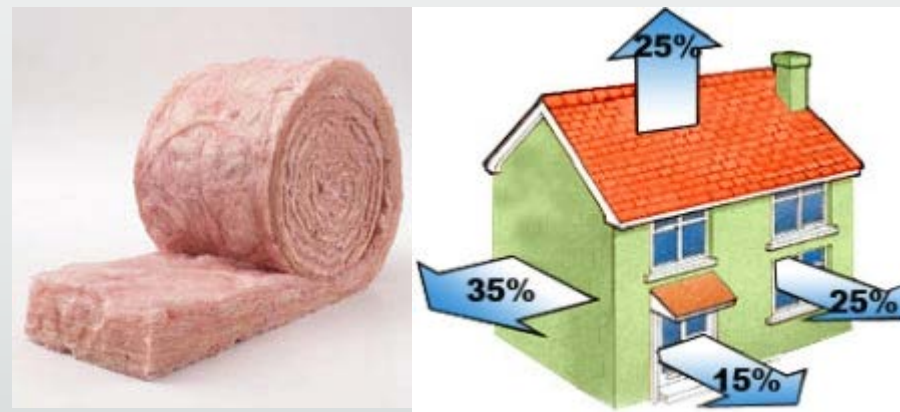
- Primary fuels are cordwood, wood chips, wood pellets
- Pros
  - Local fuel source means more money stays local
  - Generally require more local labor, which means local jobs
- Cons
  - Can be very labor intensive
  - Typically for lower heating requirements

## ■ Heat Pumps

- Work on refrigeration principals
- Draws heat from ground, air, water and redirects it inside
- Pros
  - Very low maintenance
  - Can be reversed to provide cooling on hot summer days
- Cons
  - Require lots of electricity
  - Will not work below certain outside air temperatures
  - Still undergoing arctic testing

# The 1<sup>st</sup> Step - Energy Efficiency

- Make our homes, workplaces and communities energy efficient
  - Energy Efficiency appliances
  - Upgraded lighting
  - Tighten the shell (windows, insulation, etc.)
- Energy Efficiency is far cheaper than renewable energy
- Once efficient, pursue renewable energy



# Why Biomass?

- **Lowers energy costs with a local fuel**
- **Maintains cash flow within a community**
- **Creates local jobs and businesses**
  - Construction
  - Operation/Maintenance
  - Harvest/Thinning/Resource Management
  - Heat Utilities
- **Supports the Forest Products Industry**
  - Use for sawmill waste
  - Use for forest health/thinning residue



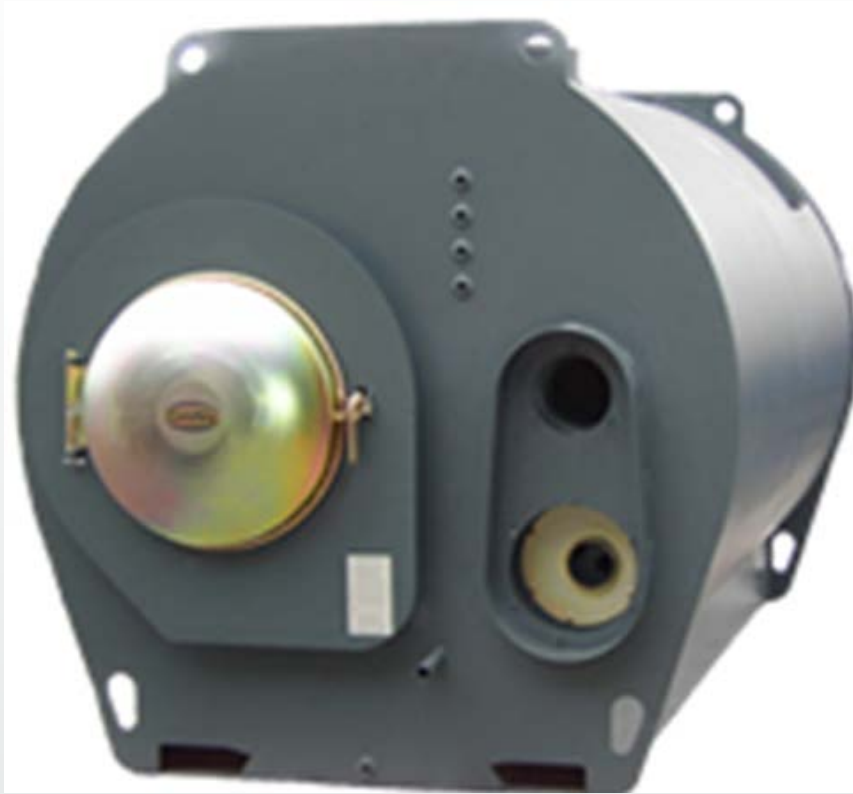
# Alaska – Where Woody Biomass Can Work!



# Cordwood Boilers

- Lots of Job Creation
  - Harvesting
  - Splitting/ stacking/ storing
  - Regular Stoking
- Easy maintenance
- More difficult to integrate into existing heating system





# Wood Chip Boilers

- Easy to operate
  - Mostly automated
  - Minimal maintenance
- More complex maintenance
- Relatively easy to produce fuel
  - Fuel Handling requires a lot of planning
  - High quality fuel is difficult to keep consistent





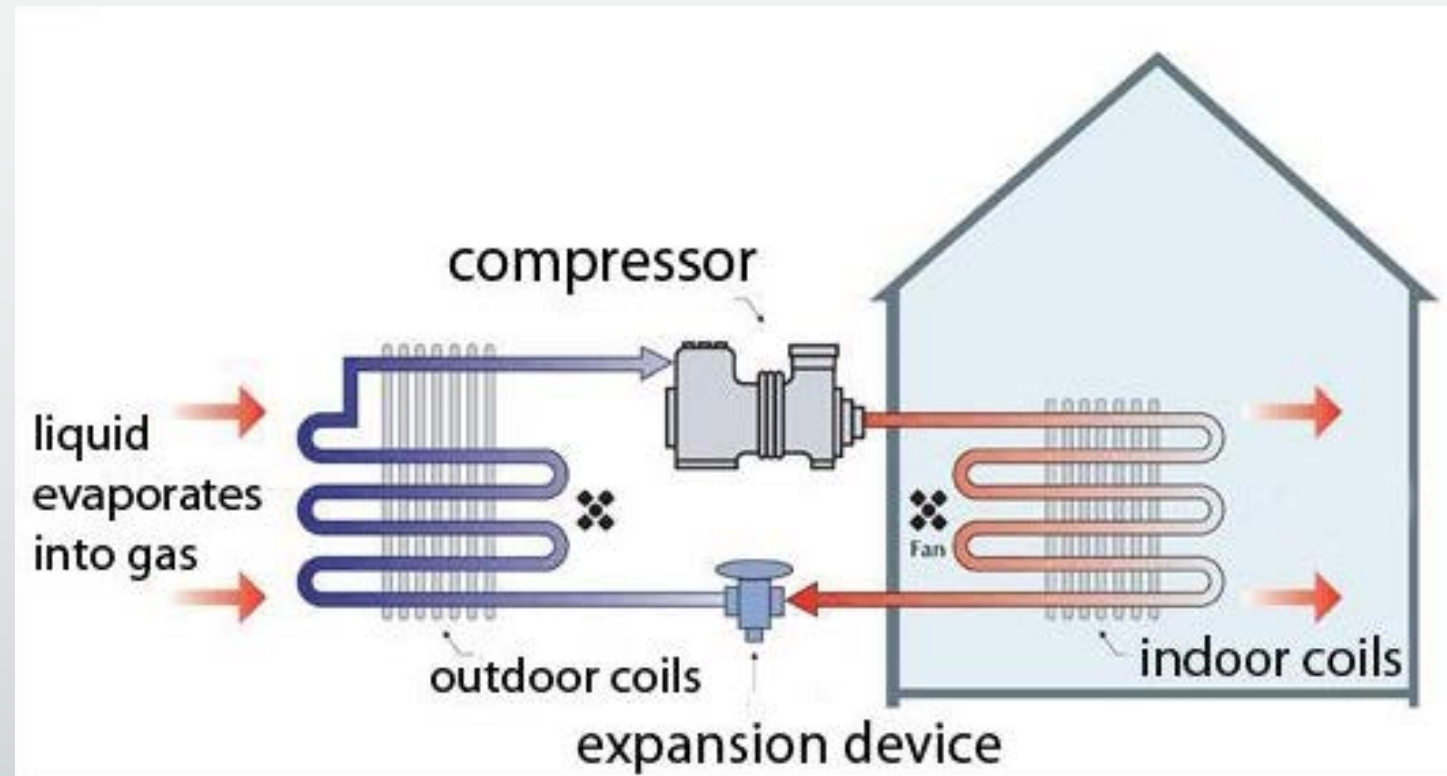
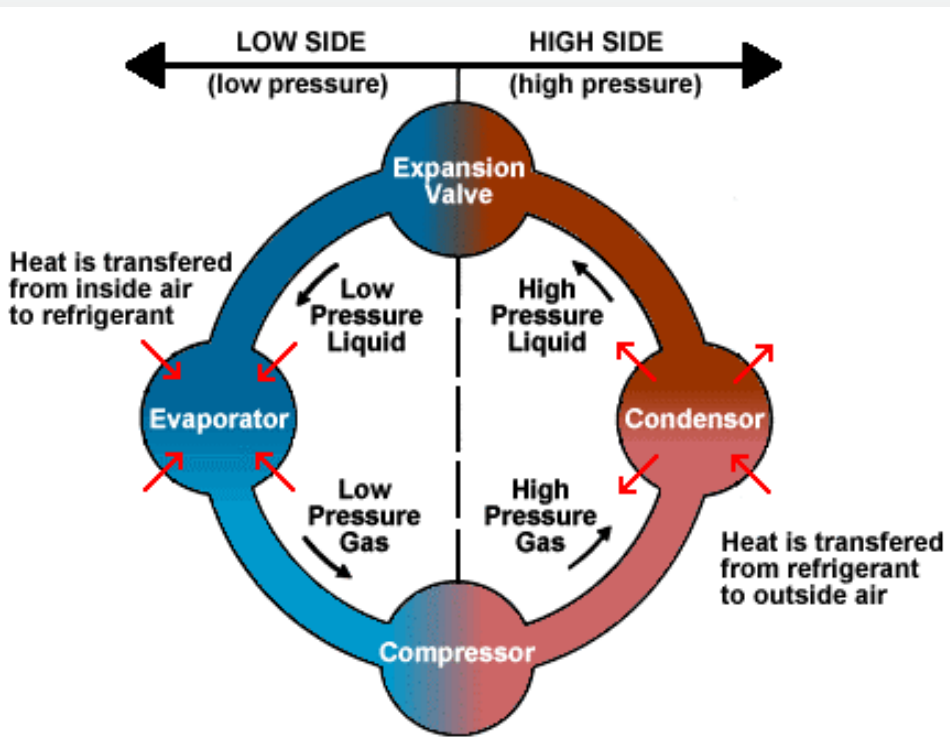
# Pellet Boilers

- Easy to operate
  - Mostly automated
  - Slightly more maintenance than oil boilers
- Specialized Fuel
  - Will depend on local suppliers
  - Easy to handle



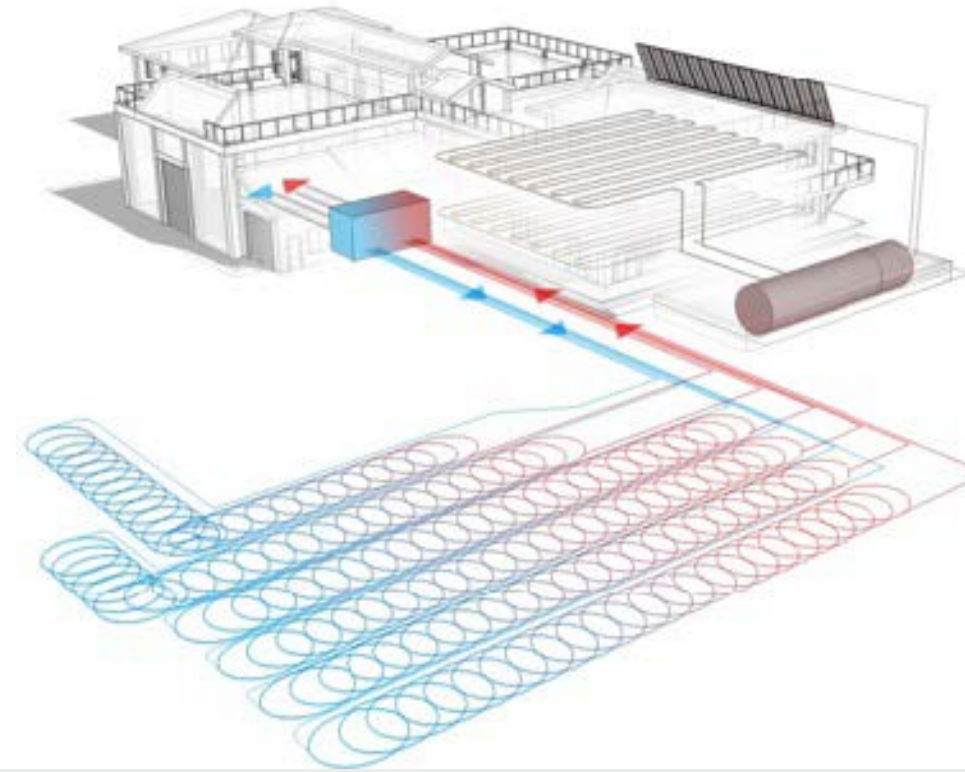
# Heat Pumps

- Based on refrigeration cycle
- Still under research in Arctic environment
- Low Maintenance
  - Runs like a refrigerator, slow and steady
  - Very efficient
- Somewhat complex system
  - May require specially trained service technician
- Can potentially consume a lot of electricity
  - Will displace other heating fuels



# Ground Source Heat Pump

- Draws heat from the ground
- Same principle as permafrost foundation stabilization
- Operate with minimal maintenance
- Can create permafrost
  - Being studied by CCHRC



Photos from Molly Rettig, CCHRC

# Air Source Heat Pump

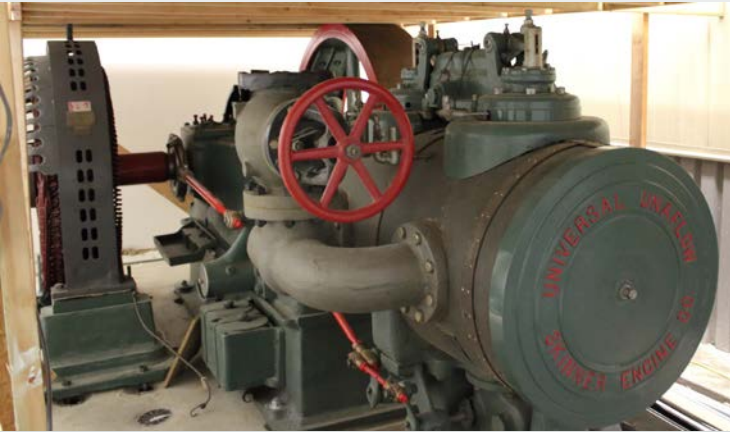
- Draws heat from the air
  - Condenses fluids to boost thermal energy
- Can operate as both heating and cooling appliance
- Several types
  - Ductless mini-splits
  - Conventional
  - Air-to-water



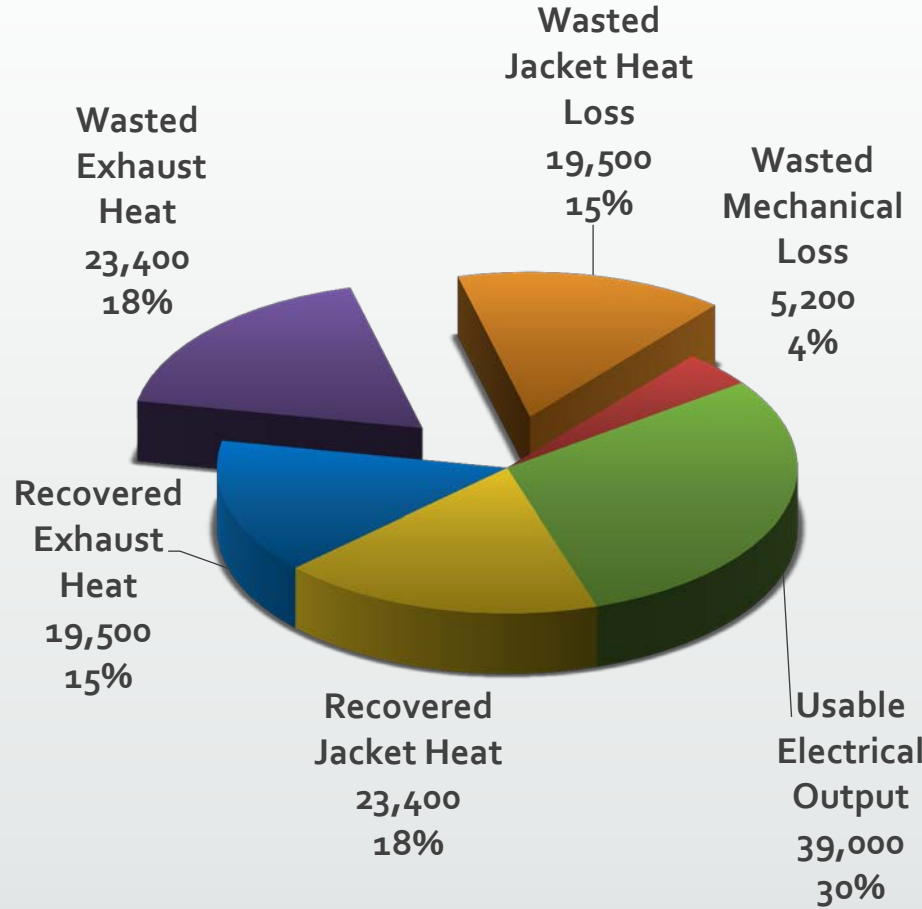
- Currently being tested and researched throughout the state
  - Performing *very* well in SE Alaska
  - Preliminary results promising in NW region
- Requires cheap electricity to make economic sense

# Combined Heat & Power (CHP)

- Generate heat and electricity at the same time
  - Similar to heat recovery on some generation systems
- Efficient use of generation fuel



## Typical Diesel Generation



# Modular CHP Systems

- Various systems on the market
- Volter Oy being tested in Fairbanks





Photo by Chuck Berray

# Questions?

